CDMA Roaming &
450 MHz

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Product Manager, Engineering Services
QUALCOMM Incorporated
Agenda

- Advancements in CDMA Roaming
- Benefits of CDMA at 450 MHz
- CDMA 450 MHz Deployments
- Who is roaming with CDMA 450 MHz
- Growing the 450 MHz Roaming Market
The CDMA Roaming Community has been actively involved in facilitating a broader adoption for CDMA subscribers to roam domestically and internationally. The CDG’s International Roaming Team (IRT) has provided reference documents for the following topics:

- PRL Enhancements
- + Code Dialing
- Packet Data Roaming for 1x and EV-DO
- Prepaid roaming
- Interstandard Roaming
- Standardized Testing
- Billing Considerations
- Implementation guides
PRL Enhancements

• **OBSERVATION:** Current implementation of PRL’s is through the use of SIDs/NIDs, therefore, having to provision each handset with hundreds of SIDs for each carrier’s roaming partners. The lack of OTASP implementation in some networks provides for PRL updates to not be received by the subscriber.

• **RESOLUTION:** Software enhancements, in the network, allow an operator to identify all of their base stations with one single identifier of their own Mobile Country Code (MCC) Mobile Network Code (MNC).

• **BENEFITS:** This eliminates the need for phones to be programmed with all of the SIDs/NIDs of a particular operator whom international roaming is desired. The use of the enhancement also allows for far less management and coordination of updating partner PRLs when a change is made within their network. Therefore, allowing a far better experience with international roaming partnerships.
+ Code Dialing

- **OBSERVATION:** As an international roamer moves from one country to another, the roamer needs to identify international dialing access numbers for each country visited.

- **RESOLUTION:** Feature is currently standardized in IS-875 and IS-2000 for CDMA. Currently IRT is working on the first phase of the solution which allows for the use of lookup tables within the handset. Longer term solution is for a network implementation in which all vendors and handset OEM’s would need to work together to support.

- **BENEFIT:** With the use of a single key the roamer can populate the international dialing access number.
Packet Data Roaming for CDMA2000 1x & EV-DO

• **OBSERVATION:** Significant operator interest in Packet Data Roaming. Initially there was no consistent approach for interconnection, billing, or testing in packet data roaming. Operators were “reinventing the wheel” for each new roaming relationship.

• **RESOLUTION:** IRT has completed the CRX (CDMA Roaming eXchange) specification for roaming interconnection and billing via a 3rd Party Partner. CDG Reference Documentation #79 specifies implementation of bilateral interconnection and billing between operators. Current CDG IRT initiative to standard packet data testing

• **BENEFITS:** Standardized approaches greatly facilitate packet data roaming implementations (for both CRX and bilateral implementations)
Prepaid Roaming

• **OBSERVATION:** Prepaid service offerings have significant market share in the CALA, South America, India and the Asia Pacific region. Prepaid subscribers have a need to roam onto other networks while maintaining a prepaid subscription.

• **RESOLUTION:** IRT working group proposed to develop a standardized approach to support the service.

• **BENEFITS:** Prepaid subscribers to have the same benefits of roaming as postpaid subscribers.
Interstandard Roaming

**OBSERVATION:** New integrated chipsets provide support for multiple technologies in roaming environments

**RESOLUTION:** 3GPP2 TSG-X teams have nearly completed standardization for CDMA/GPRS roaming and CDMA/GPRS call flows. IRT working group completed CRX document to support billing and interoperability guidelines for roaming exchanges without the need for direct connectivity between carriers for voice and data.

**BENEFITS:** Extends roaming footprint worldwide for all technologies
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The Six C’s of CDMA for 450 MHz

- CAPACITY- CLARITY- COVERAGE- COST- COMPATIBILITY – CUSTOMER SATISFACTION -

• The hallmark for CDMA is the amount of capacity increases over other technologies. CDMA at 450 MHz allows for the largest amounts capacity gains with fewer base stations
  – Fast forward link power control
  – Forward link diversity (reduces single path fading)
  – Enhanced selectable mode vocoder
  – Low interference rejection requirements
  – Transmit diversity
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Where has CDMA 450 MHz been Deployed?

- Trial
- Regulatory investigation
- CDMA450 deployments announced or planned
- CDMA450
# Operator Growth for 450 MHz - EUROPE

<table>
<thead>
<tr>
<th>OPERATOR</th>
<th>COUNTRY</th>
<th>STATUS</th>
<th>VENDOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telemobile/Zapp</td>
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<tr>
<td>Delta Telecom/Skylink 5 Regions</td>
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<tr>
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<td>Russia</td>
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<td>Belcel</td>
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<tr>
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**NEW**
## Operator Growth for 450 MHz - ASIA

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## Operator Growth for 450 MHz - AFRICA

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# Operator Growth for 450 MHz - AMERICAS

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<tr>
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<td>Lucent Huawei ZTE</td>
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<td>Telefonica</td>
<td>Peru</td>
<td>trial</td>
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NEW
Summary of 450 MHz Network Growth

Deploying/Commercial = 22
Trials = 6
Contract = 1
Total = 29 450 MHz Networks
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The Simplified Carrier Model

100% User

User

User + Network

Network

100% Operator
CDMA 450 ROAMING

• WHO IS ROAMING WITH CDMA 450?

NO ONE

– Only 1 effort has been made in terms of 450 roaming: SKYLINK – Completed CDMA 450/ GSM “PLASTIC” Interstandard roaming call. Currently, ANSI 41/MAP converter is under development.
Observations

- CDMA 450 network growth has accelerated in 2004
- Limited infrastructure solutions to support roaming
- Limited interconnect/gateway solutions by third party solution providers
- Business cases have been unpredictable
- CDMA 450 operator community lack of communication
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CDMA 450 Roaming Models

- CDMA 450 – CDMA 450 Roaming
  - Direct connect
  - Use of the third party interconnect
- CDMA 450 – CDMA 800/1900/2100 MHz Roaming
  - QCT evaluating chipset based solution
- CDMA 450 – Interstandard Roaming
  - Plastic roaming proof of concept by Skylink completed

THE KEY TO GROWING THE CDMA 450 ROAMING MARKET TODAY IS:
CDMA 450 to CDMA 450 Roaming
### QCT RF Road Map with Engineering Sample Dates

<table>
<thead>
<tr>
<th></th>
<th>CDMA2000</th>
<th>CDMA2000 / GSM-GPRS</th>
<th>WCDMA (UMTS)</th>
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<td>1X</td>
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<tr>
<td>Single Band</td>
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</tbody>
</table>

### Notes:
- **CDMA2000**: 1X | DO | REV. D
- **CDMA2000 / GSM-GPRS**: UMTS
- **WCDMA (UMTS)**: GSM / GPRS, HSDPA / EDGE

### Engineering Sample Dates:
- RFR6176: 4Q '03
- RFR6178: 4Q '03
- RFR6200: 2Q '04
- RFR6202: 2Q '04
- RFR6250: 3Q '04
- RFR6275: 2Q '06

### Technical Specifications:
- **CDMA2000**: Cell, Cell+KPCS/PCS/IMT Diversity
- **CDMA2000 / GSM-GPRS**: 2CDMA+2GSM
- **WCDMA (UMTS)**: IMT/PCS+4GSM, IMT/PCS+4GSM (RFCMOS)
THANK YOU

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